QA Project Plan

Foote Brook Biomonitoring Initiative - Phase II

[Grant number to be assigned]

Prepared by:

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Prepared for:

Lake Champlain Basin Program
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March 11, 2002

Allison Cardwell — 3/18/02
Allison Cardwell, Project Manager — Date

Erik Beck, EPA Project Manager — Date

3/12/02
Geoff Dates, River ~~Watch~~ Network, Project QA Officer — Date

Charles Porfert — 5/14/02
Charles Porfert, EPA QA Officer — Date

Rec 5/9/02
RTN 02283

2. Table of Contents

3. Distribution List

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4. Project Task Organization

Project Manager:

Allison Cardwell, Director, Lamoille County Natural Resources Conservation District & Nature Center, 802-888-9218

Responsibility: Overall project management, including overall QA/QC, field and lab supervision, and data processing.

Training

Allison Cardwell, Director, Lamoille County Natural Resources Conservation District & Nature Center, 802-888-9218

Carrie Riker, Education Coordinator, Lamoille County Natural Resources Conservation District and Nature Center, 802-888-9218

Chris Tormey, Lamoille Union High School Biology Teacher, 802-888-4261

Sheila Tymon, People's Academy High School Biology Teacher, 802-888-4600

Responsibility: train volunteers in field and lab methods.

Taxonomic Verification:

Geoff Dates, River Watch Program Director, River Network, 802-436-2544

Steve Fiske, Aquatic Biologist, VT Department of Environmental Conservation, Water Quality Division, 802-244-4520

Responsibility: verification of family identification.

Data QC and Review

Allison Cardwell, Director, Lamoille County Natural Resources Conservation District and Nature Center, 802-888-9218

Geoff Dates, River Watch Program Director, River Network, 802-436-2544

Program Review

Geoff Dates, River Watch Program Director, River Network, 802-436-2544

Foote Brook Biomonitoring Advisory Committee

- Allison Cardwell, Director, Lamoille County Natural Resources Conservation District and Nature Center 802-888-9218
- Chris Tormey, Lamoille Union High School Biology Teacher, 802-888-4261
- Sheila Tymon, People's Academy High School Biology Teacher, 802-888-4600
- Tania Bacchus, Chair, Johnson State College Environmental and Health Sciences Department, 802-635-1329
- Local Landowners

5. Problem Definition/Background

Foote Brook drains 8.49 square miles in the towns of Johnson and Belvidere, Vermont. It rises at an elevation of 2650 feet above sea level and drops 485 feet to its confluence with the Lamoille River. Foote Brook has the highest population of trout for streams in Lamoille County. The channel is primarily a step-pool and plane-bed type system. Nearly the entire watershed is forested above the Route 15 crossing.

Severe flood events in 1995 and 1997 caused several culverts to fail, road damage, woody debris jams, and excessive sedimentation of the channel. Just upstream of the Route 15 bridge, the channel bed is actively degrading, entrenched, and the banks are over-steepened and unstable. The channel is adjusting by migrating laterally close to Route 15. The bed is scouring upstream of the bridge abutment.

A restoration project will use natural channel design techniques to protect the Route 15 road embankment and bridge abutment, stabilize eroding streambanks, enhance fisheries and wildlife habitat, and increase woody riparian buffers.

The organizers of the monitoring project want to document the condition of the benthic macroinvertebrate community above, at, and below the restoration site. The primary purpose of data collection is to provide a tool for community education. Additionally, Lamoille County Natural Resources Conservation District will use the results to assess the impact of the physical restoration on the biological integrity of the brook. This assessment is designed as a simple screening level assessment that will be able to detect gross changes in the community over time. The project's goal is to produce data that can be used to supplement more rigorous assessment carried out periodically by the VT DEC. Although these data will not be relied upon to determine impairment, or for enforcement actions, data quality requirements for sampling and analysis will be strictly followed according to protocol. Sampling and analysis are discussed further in section seven.

6. Project/Task Description

Trained and supervised volunteers will collect and analyze benthic macroinvertebrate samples and assess habitat quality above, within, and below the restoration site. They will use methods and documentation developed and supplied by River Network in its benthic macroinvertebrate monitoring manual, "Living Waters."

Volunteer Recruitment (Spring-Summer, 2002): Volunteers will be recruited from local communities and schools. Our goal is to recruit at least 10 volunteers in addition to participating high schools to assist with the monitoring.

Training (initial: late Spring, complete training: early September 2002): Volunteers will be trained in the collection procedures by Conservation District staff, and local high school biology teachers, who help facilitate the first phase of the Foote Brook Biomonitoring Initiative.

Sampling: In mid-September, three replicate samples will be collected at each site by disturbing the stream bottom and catching dislodged organisms in a net. Each replicate will consist of a composite of two fast and two slow areas in riffle habitat, collected from a standardized area as wide as the net and one-foot deep.

Preservation: Unsorted samples will be preserved in jars filled with 90% ethyl alcohol.

Subsampling (Fall 2002): Organisms will be picked from the detritus in a lab. 1/4 of the sample will be picked from a gridded tray. If this totals at least 300 organisms, subsampling will stop. Otherwise, more squares will be picked until at least 100 organisms are picked. Unpicked samples will be preserved.

Identification (Fall 2002): Organisms will be identified to the following taxonomic levels: mollusks to order, worms to class, crustaceans and insects to family. Reference materials will include the following:

> Fiske, Steve & Jack Byrne. March 1988. *Key to the freshwater macroinvertebrate fauna of New England.* Montpelier, VT: River Watch Network.
>
> McCafferty, W. Patrick. 1998. *Aquatic Entomology.* Sudbury, MA: Jones & Bartlett Publishers.
>
> River Watch Network, 1993. *A simple picture key: Major groups of benthic macroinvertebrates commonly found in freshwater New England streams.* Montpelier, VT: River Watch Network.
>
> Unpublished. Miscellaneous keys to Mayflies, Stoneflies and Caddis Flies prepared by River Network.

Data Analysis (Winter 2002/Spring 2003): A standard set of metrics will be used to assess the condition of the biota: abundance, family richness, percent model affinity of orders, pollution tolerance, and functional feeding group % similarity. When the higher taxonomic identification allows, we will compare results with VT's proposed biocriteria. In any case, results at downstream sites will be compared with either an upstream reference site, or a regional reference site identified by the VT DEC.

Reports (Spring 2003/early Summer 2003): A non-technical report will be prepared by the project manager with assistance from Geoff Dates. The report will describe the background, methodology, data summary, finding, and conclusions. Raw data summaries will be sent to the VT DEC and other interested agencies.

7. Data Quality Objectives for Measurement Data

The project's goal is to produce data that can be used to supplement more rigorous assessment carried out periodically by the VT DEC. Sampling and data analysis will follow strict protocol. Project leaders will guide all stages of the project to ensure proper methodology has been conducted.

Sampling

Sample Type	Completeness	Representativeness	Comparability
Benthic macroinvertebrates	Samples from all 3 sites must be collected.	3 replicate composite samples must be collected from each site.	Sampling must be a comparable level of effort to that used by the VT DEC.

Analysis

Sample Type	Accuracy	Precision	Measurement Range
Benthic macroinvertebrates	95% of all organisms must be identified correctly	N/A	Insects – family Crustaceans – family Mollusks – order Worms - class

Three composite replicates will sample the riffle in 12 different locations. This assures that to the extent practical we will be sampling a sufficient portion of the distribution of macroinvertebrates. This modifies the 1999 version of the EPA Rapid Bioassessment protocols and is similar to the Vermont DEC protocol. Modifications were made to be more detailed, quantitative and replicable, and therefore easier for volunteers to use. Each step of the study will be thoroughly analyzed during the project to verify proper protocol procedure.

There will be strict guidelines to follow in terms of sample handling, preservation and archiving. More effort will be put on correct procedure in sampling jar labeling, such as labeling the outside of the sample jar and also inserting a piece of waterproof paper in the jar. The reference collection will also be double-checked before being sent for taxonomic verification. The Project Manager shall oversee that each step is followed correctly.

8. Training Requirements

Volunteers will be trained in each phase of benthic macroinvertebrate collection and analysis as follows:

Session 1: Background and field sampling. Volunteers will be trained in the morning and then go out that same day to collect and preserve samples. The study purpose and methodology will be explained. Collection methods, as identified in Section 11, will be described and demonstrated at one of the collection sites. A copy of *Living Waters*, to be available to volunteers, includes protocols, keys and data-sheets to be used for the study. Please refer to section VI B for information about data collection and sections VIII A and VIII C for information about sub-sampling and identification. The trainer and project manager will then observe volunteers.

Session 2: Introduction to taxonomy and subsampling. Volunteers will be trained at an evening session in subsampling and identification techniques. A brief introduction to macroinvertebrate taxonomy and morphology will prepare participants for subsampling. Subsampling will be demonstrated by the trainer and then carried out by participants. Organisms will be rough-sorted at this time.

Session 3: Introduction to the families of Mayflies. Volunteers will be trained at an evening session to identify families of mayflies. A brief introduction to mayfly taxonomy, life history, and morphology will prepare participants for identifying mayflies in subsamples.

Session 4: Introduction to the families of Stoneflies. Volunteers will be trained at an evening session to identify families of stoneflies. A brief introduction to stonefly taxonomy, life history, and morphology will prepare participants for identifying stoneflies in subsamples.

Session 5: Introduction to the families of Caddis Flies. Volunteers will be trained at an evening session to identify families of caddis flies. A brief introduction to caddis fly taxonomy, life history, and morphology will prepare participants for identifying caddis flies in subsamples.

Session 6: Introduction to the families of Diptera (and everything else). Volunteers will be trained at an evening session to identify families of all other insects and crustaceans in the samples. A brief introduction to insect and crustacean taxonomy, life history, and morphology will prepare participants for identifying organisms in subsamples.

There will be more training in proper sample handling, archiving and preserving procedure, in order to eliminate potential problems. Due to the fact that all samples will be preserved, no formal volunteer certification will be required.

9. Documentation and Records

There will be forms for each step in the collection and analysis process, from River Network's benthic macroinvertebrate monitoring manual. The following forms will be used to track possession and handling of each sample:

1) *Benthic Macroinvertebrate Collection Field Sheet*: one per site to be filled out when samples are collected.
2) *Benthic Macroinvertebrate Sample Processing Record*: one per replicate to be filled out when samples are picked
3) *Benthic Macroinvertebrate Identification Lab Sheet*: one per site (results for each replicate are recorded separately on this sheet) to be filled out as samples are identified.

Completed forms will be stored in a binder maintained by the project manager.

10. Sampling Process Design

Three sites above, at, and below a stream channel restoration project on Foote Brook will be sampled once per year in September. Samples will be collected from "riffle" habitat areas. Riffles are defined as shallow (1-2' deep), fast moving (0.4 - 2.5 feet per second), cobble bottom areas. Exact site locations have been determined based on the final engineering plans for the natural channel design. Natural Channel Design construction will be completed during the end of September and beginning of October 2001. Three types of sites will be sampled:

- **Upstream Reference (Control) Site:** This site is upstream of the impaired channel reach. It represents conditions in the stream prior to the impact of the channel instability.
- **Impact Site:** This site is in the unstable reach. It represents conditions in the stream at the point of impact of the alteration.
- **Recovery Site:** This site is downstream of the unstable reach. It represents conditions in the stream after the impacts of the alteration have begun to diminish.

The following table lists the sites that will be sampled:

Site #	Brief Description of Location	How and Where the Site Will Be Sampled	Type of Site
		Grab sample from riffle	Reference
		Grab sample from riffle	Impact
		Grab sample from riffle	Recovery

All samples will be analyzed at a lab at a local high school.

11. Sampling Methods

Samples will be collected as follows:

- Three replicate composite samples will be collected by teams of 2 people from riffle habitats using a metal frame net with an opening of 8" X 18" and a 8"h X 8"d X 18"w and a bag with a 500 micron mesh.
- Collection - An area as wide as the net and 1-foot deep will be sampled by rubbing and brushing off the cobbles, then gently digging into the bottom to dislodge burrowing organisms.
- Each replicate composite sample will be a composite collected from 4 spots in the riffle: 2 in fast current (≈ 1.5 to 2.5 feet per second) spots and 2 in slow current (≈ 0.5 to 1.5 feet per second) spots. Note that the current may not be that variable in some riffles and "fast" and

"slow" are judgements on the part of the sampler relative to each riffle. Samples will be composited in the net, or in a sieve bucket, if the net shows signs of plugging.

- Each replicate composite sample is preserved in plastic quart jars in 90% ethyl alcohol and labeled (site #, date, replicate #) separately and a *Benthic Macroinvertebrate Collection Field Sheet* filled out for all three.
- Nets will be back-washed and inspected for carried over organisms between each replicate composite sample.
- Samples can be held indefinitely.

12. Sample Handling and Custody Requirements

Each replicate sample will be labeled in the field using grease pencil on labeling tape. Each label will include the site #, the replicate #, and the date. A *Benthic Macroinvertebrate Collection Field Sheet* will be filled out for each site. This sheet will accompany the samples and be related to each replicate sample by the site # and date.

The *Benthic Macroinvertebrate Collection Field Sheet* records the following information:

- Site #
- Date and Time Collected
- Stream Name
- County
- State
- Site sketch showing where samples were collected
- Site Description
- Weather Info
- Collection Sample Type
- # of Replicates Collected
- Investigators

Samples and field sheets will remain with the sampling team until they are turned over to the project manager at the Lamoille County Natural Resources Conservation District (LCNRCD) office. Samples will be stored there until analyzed.

Subsamples will be stored in glass scintillation vials with sealed screw caps and filled with 90% ethyl alcohol. Each vial will be labeled as follows:

- Site #
- Date Collected
- Replicate #
- # __ of __

As each replicate is subsampled and identified, a *Benthic Macroinvertebrate Sample Processing Record* will be filled out. This form records all phases of the analysis of that replicate:

- Site #
- Date Collected
- Date sample picked
- Replicate #
- Stream Name
- Total # of organisms picked

- # squares picked
- Names of pickers and identifiers
- Date major groups identified
- Date families identified

The form also contains a diagram of a gridded tray. As each square is subsampled, an "x" is placed in that square on the diagram.

Identification results for each site (all 3 replicates) are recorded on the *Benthic Macroinvertebrate Identification Lab Sheet-Level 2*. The form is essentially a list of taxa. The number of taxa found in each replicate is recorded on this sheet, one column per replicate. In addition to the list, the following information is recorded on this form:

- Site #
- Stream Name
- Date Sampled
- Dates of lab Work
- Names of pickers and identifiers
- Total # of squares picked from each replicate
- # of squares in tray grid

All forms will be stored in a binder at the LCNRCD office, maintained by the project manager.

13. Analytical Methods.

Samples will be analyzed as follows:

1. Adult and student volunteers will process each preserved sample in a high school biology lab.
2. Picking - Samples will be rinsed through a #30 sieve and spread evenly into a shallow plastic white tray with a 12-square grid, with each square numbered on the bottom, with about 1/4" of water. All the organisms will be picked from 3 random squares using a lighted magnifier and forceps. Selecting 1 of 12 pre-numbered sheets of paper out of a "hat" will generate random numbers. If 300 organisms have been picked, processing stops. Otherwise, entire additional random squares will be picked until at least 300 organisms are reached. Once all organisms are picked, the entire tray will be inspected for rare taxa that were not picked in the subsample. One of each of these rare taxa will be picked and combined with the subsample.
3. Sorting - As they are picked, each organism will be rough-sorted into major groups in a 4-compartment petri plate with ethyl alcohol. At this point, samples will be archived in labeled alcohol-filled scintillation vials for later identification.
4. Identification - Identification will be to the following levels, using at least 40X dissecting scopes:

   Insects - Family
   Crustaceans - Family
   Mollusks - Order

Worms - Class

- Identification will be recorded on lab sheets for each site. Certain taxa may be identified to lower taxonomic levels (genus, species) to increase the resolution or level of information. All specimens will be archived in labeled alcohol-filled scintillation vials.

5. A reference collection was created from the unpicked portions of the samples in phase I of the Foote Brook Biomonitoring Initiative.

14. Quality Control

Quality Assurance

Training: Volunteers will be trained in field and lab procedures at training workshops led by Conservation District Staff, and local biology instructors. Procedures are described in section 8 above.

Sampling Organization: Both for safety and for quality assurance, samplers will be organized into teams of at least two and possibly three people. Efforts will be made to pair new samplers with experienced samplers on these teams.

Sampling Equipment and Supplies: Before each sampling, nets will be checked for tears in the mesh and repaired or replaced as needed. Sieve buckets will be checked for cracks and breaks and replaced as needed.

Sample Handling, Preservation, and Archiving: Conservation District Staff and Biology instructors will make periodic checks of sample handling procedure regularly throughout the project period. Proper vial and jar labeling will be emphasized so re-processing can occur at any time. All samples will be housed at the Lamoille County Conservation District with accompanying records.

Data Management: All data on field and lab sheets will be checked by the Project Manager prior to computer entry. 10% of all computer entries will be double-checked against field and lab sheets.

Documentation: Basic information about sampling and analysis is recorded on sheets described in section 9 above. Step-by-step field and lab methods are described in River Network's "Living Waters," a benthic macroinvertebrate monitoring manual. We believe that there is a copy of "Living Waters" on file with the QA unit at EPA New England. If you do not have a copy, we would be happy to send one.

Reporting: Results will be contained in periodic (at least once per year, written reports that summarize the results for the residents of the watershed. Uninterpreted raw data will be sent to the VT DEC, USEPA Region 1, and other agencies and organizations that request it. The raw data and the summary report will be submitted as part of the final report for the Foote Brook Biomonitoring Initiative - Phase II, which has been funded by Lake Champlain Basin Program.

Quality Control

Quality control measures will consist of the following:

1. Replicate composite samples – 3 per site to assure representativeness.
2. All identified samples will be preserved and archived. Archived samples may be identified to lower taxonomic levels if needed.
3. A reference collection will be used to aid with identification accuracy.
4. A random 10% of all samples will be checked for proper identification by a VT DEC aquatic biologist.
5. Lab volunteers will be tested as to their identification skills at workshops. Stations will be set up with labeled (known) and unlabeled (unknown) critters in petri plates and volunteers asked to correctly identify the unknowns.
6. If possible, replicate samples will be collected by the VT DEC from at least one of the sites on the same day.

15. Equipment Testing, Inspection and Maintenance

Before each sampling, nets will be checked for tears in the mesh and repaired or replaced as needed. Sieve buckets and sieves will be checked for cracks and breaks and replaced as needed.

16. Instrument Calibration and Frequency

No recording instruments will be used.

17. Inspection and Acceptance Requirements for Supplies

Nets are metal frame types with a nylon fabric ("nitex") bag with 500-micron mesh. The bags are attached before use and are replaceable. The mesh will be measured upon receipt.

18. Data Acquisition Requirements

The LCNRCD used stream geomorphic data gathered by Jim Ryan to document the condition of the channel. The Lamoille County Watershed Assessment funded by FEMA Project Impact, primarily used Rosgen Level II Channel Assessment. However, Rapid Geomorphic Assessment, aerial photo interpretation, flood insurance map analysis and hydraulic modeling were also used to gather information.

19. Data Management

Field collection sheets will be inspected for completeness by the project manager upon delivery to the LCNRCD office.

The project manager will inspect lab sheets for completeness when turned in at the end of each lab session.

Taxonomic data will be entered into a set of Excel spreadsheets provided by River Network. These spreadsheets consist of data entry sheets that resemble the lab sheets, linked to a summary spreadsheet. Most of the metrics are calculated within the data entry spreadsheets. These are linked to a summary spreadsheet that shows the results for all metrics for all three sites. A second individual will randomly check data entry.

20. Assessment and Response Actions

The two tasks that can introduce uncorrectable error into this project are sampling and subsampling. Since samples are preserved, errors of identification can be corrected after the fact. Therefore, assessment will focus on evaluating performance of these two tasks. The project manager and QA officer will accompany a sampling team to evaluate their technique. Problems will be corrected on site. She will also attend lab sessions to assess and correct subsampling performance.

Many identifications will be verified in the lab by the trainer during the taxonomy training. Consistent misidentifications will be noted and corrected on site. Suspected previous misidentifications will be re-checked and re-identified.

21. Reports

A non-technical report will be prepared annually by the project staff. The report will describe the background, methodology, data summary, finding, and conclusions. Raw data summaries will be sent to the VT DEC and other interested agencies.

Reports will be distributed to all project participants and other individuals, organizations, and agencies that request them. The raw data and the summary report will be submitted as part of the final report for the Foote Brook Biomonitoring Initiative - Phase II, which has been funded by Lake Champlain Basin Program.

22. Data Review, Validation, and Verification Requirements

Data will be reviewed by the project manager and the data QC and review leader. These people will decide the extent to which data meet quality objectives and whether to use, qualify, or reject the data.

23. Validation and Verification Methods

An individual other than the data entry person will randomly check computerized data against lab sheets. In addition, project staff and the data QC and review leader will review taxonomic data for taxa unlikely to be found in this region or stream type. If these are found, samples will be checked for correct identification.

The most abundant and diverse replicate will be re-identified by Geoff Dates of River Network or a VT DEC aquatic biologist to verify correct identification. If errors are found, those taxa will be rechecked and corrected in all the samples.

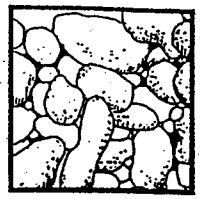
24. Reconciliation with Data Quality Objectives

The project manager will check the number of samples and replicates collected immediately after sampling. If needed, and if possible, additional samples will be collected to meet completeteness and representaiveness objectives.

Identification accuracy will be checked and responded to as described in section 23 above.

Updated 8/29/00

Rapid Habitat Assessment Field Sheet
Rocky Bottom Streams



Before You Begin: Measure a 200' segment of river. Sketch this segment on page 3.

Segment Background Information

Segment Number: _____ Date: _____ Estimated Elevation: _____

Stream/River Name _____ Watershed _____

County _____ State: _____

Investigators: _____

River Mile (from mouth): _____ Latitude/Longitude _____

Segment Location: _____

Air Temperature: _____ Water Temperature: _____

Weather

Now	Past 48 Hours
☐	☐ Clear / Sunny
☐	☐ Overcast
☐	☐ Showers
☐	☐ Rain (steady rain)
☐	☐ Storm (heavy rain)

Habitat Characteristics

1. Bottom Composition

a. Bottom Composition: *Estmate the % of the river bottom that is composed of the following materials:*

_____ % Bedrock _____% Boulder *(>10")* _____% Cobble *(2 - 10")* _____% Gravel *(0.1 - 2")* _____% Sand *(<0.1")* _____% Silt *(very fine)* _____%leaves

b. Submerged Large Woody Debris # of submerged large woody debris *(logs and snags)* _____

Relative Abundance: Stable, large woody debris is ☐common ☐rare ☐absent

2. Embeddedness: _____% *(surface area of larger particles (boulder, cobble or gravel) surrounded or covered by sand or silt)*

3. Velocity/Depth Combinations: ☐slow-deep ☐slow-shallow ☐fast-deep ☐fast-shallow

"Fast" = > 1 ft./sec.
"Deep" = Depth greater than 18".

a. check if present

b. circle the dominant combination

Current Velocity: *Measure the time it takes a float to travel 10 feet twice in 1 fast section and 1 slow section of the riffle.*

Calculation of Velocity: feet per second = 10 divided by the time it takes a float to travel 10 feet

Riffle:

Fast: 10 Feet / _____ seconds (measurement 1) = _____ ft/second

Slow: 10 Feet / _____ seconds (measurement 2) = _____ ft/second

Riffle Depths

Measure and record depths at 1-step intervals across a typical riffle.

1____ 2____ 3____ 4____ 5____ 6____
7____ 8____ 9____ 10____ 11____ 12____
13____ 14____ 15____ 16____ 17____ 18____

Pool Maximum Depths

Measure and record maximum depth at two pools

1____ 2____

Rapid Habitat Assessment Field Sheet

Rocky Bottom Streams

Habitat Characteristics (Cont.)

4. Sediment Deposition: *(Check abundance of sand, silt, and other fine material)*

☐ *High* (>50% of bottom affected) ☐ *Moderate* (30-50% of bottom affected) ☐ *Slight* (5-30% of bottom affected) ☐ *None*

Point bar/island Enlargement

☐ *None* ☐ *Some* ☐ *Moderate* ☐ *Heavy*

5. Channel Flow Status: _____% *of river bottom exposed (not covered with water)*

6. Bank/Channel Alteration:

(Do the banks appear to be altered or the channel straightened?) ☐Yes ☐No % Left Bank Altered ___

NOTE: *Left and right are determined facing UPSTREAM* % Right Bank Altered ___

7. Riffle Characteristics

# of Riffles Present _____

% of segment which is riffle _____

Runs Present? _____

Length of Riffles #1: _____ ft. #2: _____ ft. #3: _____ ft.

Width of Riffles #1: _____ ft. #2: _____ ft. #3: _____ ft.

Width of Stream at typical place in each riffle

#1 _____ ft. #2: _____ ft. #3: _____ ft.

8. Bank Stability: % *of banks eroding* _____ Left Bank _____ Right Bank *Note: left and right determined facing upstream*

9. Bank Vegetation: % *of banks covered by vegetation* _____ Left Bank _____ Right Bank

10. Riparian Vegetation Zone: *Estimate width of zone on both sides* _____ Left Side _____ Right Side

Other Stream Characteristics

1. **Relative Flow:** (check) present flow: ☐High ☐Average ☐Low
   relative to your estimate of year round average prev. 2 days: ☐High ☐Average ☐Low
2. **Water Odor:** ☐none ☐sewage ☐oil ☐chlorine ☐rotten eggs ☐fish ☐other_____
3. **Water Appearance:** ☐green ☐tea ☐milky ☐cloudy ☐muddy ☐clear ☐foamy ☐oily sheen ☐reddish ☐other:_____
4. **Algal Growth:** _____% *of bottom covered*
5. **Upstream Dam?:** ☐Yes ☐No How far upstream is the dam?:_____
6. **Are There Wastewater Treatment Plant Discharges Upstream?** ☐Yes ☐No Distance:_____
7. **Do You See Pipes Emptying Directly into or Near the Water?** ☐Yes ☐No How Many:___ *(locate on site sketch)*
8. **Overhead Canopy:** _____% *of stream width covered or shadowed by overhanging grasses, shrubs and trees.*

River Corridor Uses and Bank Vegetation Type

1. **River Corridor Land uses:** *Place a "D" for Dominant and "X" if Present - otherwise leave blank.. Use blank spaces for other land uses not listed.*

Roadless Wooded Area		Cropland		Dairy Farm		Scattered Residential	
Wooded Area w/ Roads		Grazed Pasture		Park Area		Village or Urban	
Woodlot Logging Area		Ungrazed Meadow		Golf Course		Commercial/Industrial	

2. **Left Bank Vegetation** (facing upstream)

   Shrubs____% Grass____% Softwood____% Hardwood____% Unvegetated____%

3. **Right Bank Vegetation** (facing upstream)

   Shrubs____% Grass____% Softwood____% Hardwood____% Unvegetated____%

Rapid Habitat Assessment Field Sheet Site Sketch

Rocky Bottom Streams

Updated 8/29/00

Draw a "bird's eye" sketch of the 200' segment of the river.

Site #: _____

River: _____

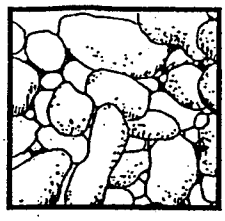
Date: _____

Locate the following features:

- Riffles
- Large Woody Debris
- Large Boulders
- Channel Alteration
- Pools
- Channel Alteration
- Heavy Sediment Deposits
- Exposed Stream Bottom
- Eroding Banks
- Riparian Vegetation Boundary

(circle directionof flow) → ←

Notes/Observations _____



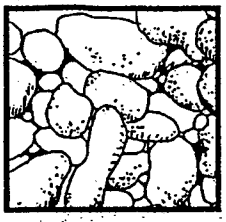
Rapid Habitat Assessment Scoring Sheet

Rocky Bottom Streams

Page 1 of 2

Segment #: _____
Date: _____
Stream/River Name
_____

Score →	*Excellent* 20 19 18 17 16	*Good* 15 14 13 12 11	*Fair* 10 9 8 7 6	*Poor* 5 4 3 2 1 0
1. Bottom Composition *Score:*_____	Cobble >50% Boulder and gravel common Large woody debris common	Cobble 35-49% Boulder and gravel common Large woody debris rare	Cobble 20-34% Boulder and gravel rare Sand or silt >50% Large woody debris absent	Cobble <20% Boulder and gravel absent Sand or silt >50% Large woody debris absent
2. Embeddedness *Score:*_____	<25%	25-50%	50-75%	>75%
3. Velocity/depth Combinations *Score:*_____	All 4 present	3 of 4 present fast-shallow dominant	2 of 4 present fast-shallow present, but not dominant	1 of 4 present slow-shallow dominant
4. Sediment Deposition *Score:*_____	None (<5% of bottom affected) Little or no enlargement of point bars and islands	Slight (5-30% of bottom affected) Some new increase in point bar formation, mostly from gravel and finer sediment	Moderate (30-50% of bottom affected) Moderate depositon of new gravel and finer sediment on old and new bars Sediment deposits at obstructions	High (>50% of bottom affected) Heavy deposits of fine material
5. Channel flow Status *Score:*_____	Water reaches the base of both banks. Minimal amount of stream bottom exposed.	<25% of stream bottom exposed	25-75% of stream bottom exposed Rocks in riffles mostly explosed.9	>75% of stream bottom exposed Most water in standing pools



Rapid Habitat Assessment Scoring Sheet

Rocky Bottom Streams

Segment #: _____

Date: _____

Stream/River Name _____

Score →	*Excellent* 20 19 18 17 16	*Good* 15 14 13 12 11	*Fair* 10 9 8 7 6	*Poor* 5 4 3 2 1 0
6. Bank/channel Alteration *Score*:_____	None or minimal and stream has normal meandering pattern	Average alteration of both banks = 10-40%, mostly at bridge abutments	Average alteration of both banks = 40-80%, Stabilizing structures present on both banks Extensive channelization	Average alteration of both banks >80% Both banks shored with gabion or cement Instream habitat greatly altered or removed
7. Riffle Characteristics *Score*:_____	> 60% of segment is riffle Riffle is as wide as stream and its length is at least least 2X stream width.	40 - 60% of segment is riffle Riffle is as wide as stream, but its length is < 2X stream width	10 - 40% of segment is riffle Riffle not as wide as stream and its length is < 2X stream width	No riffles or runs present

Score →	*Excellent* 10 9	*Good* 8 7 6	*Fair* 5 4 3	*Poor* 2 1 0
8. Bank Stability *left bank score* ____ *right bank score* ____	No erosion	<10% eroding Mostly healed	11-60% eroding	>60% eroding
9. Bank Vegetation *left bank score* ____ *right bank score* ____	>90% of streambanks and immediate riparian zone covered by native vegetation Plants allowed to grow naturally	70-90% of streambanks and immediate riparian zone covered by native vegetation Disruption evident but not greatly affecting plant growth	50-70% of streambanks and immediate riparian zone covered by native vegetation Patches of bare soil and/or closely cropped vegetation common.	<50% of streambanks and immediate riparian zone covered by native vegetation Disruption very high. Vegetation cropped to 2" or less
10. Riparian Vegetation Zone *left bank score* ____ *right bank score* ____	Width of vegetated zone is >50 feet. No evidence of human activities.	Width of vegetated zone is 35-40 feet	Width of vegetated zone is 20-35 feet	Width of vegetated zone is <20 feet

Total Score: _____